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SOURCE Automobil No12, 1947. (FIB Per Abs 12T10 -- Information requested.)USSR DUMP TRUCKS

Engr A. Dushkevich

The necessity of "ensuring the extensive application of self-unloading trucks in motor transport" was pointed out in the Law on the Five-Year Plan for the Restoration and Development of the National Economy of the USSR for 1946-1950.

Increased productivity in auto transport work, speedier turn-round of trucks, lower freight costs, and the possibility of complete mechanization of a number of loading and unloading operations are just some of the advantages of introducing dump trucks. The use of dump trucks is especially effective on short journeys, where loading and unloading forms a substantial proportion of the total work of the truck. The many and varied uses of dump trucks require their mass production in various load capacities and road capabilities, with platforms corresponding to different working conditions.

The tipping and lifting capacities of dump trucks produced abroad vary considerably. The light and medium types, 1-3 tons, are used for transporting small loads of building materials and solutions and also for agricultural freight; the heavy types, 4.5-6 tons, are used for bulk transport of freight which will readily flow or roll, and dump trucks of 10-15 tons capacity on powerful three-axle chassis for especially bulky freight in earth and cliff excavations. Semitrailer dump trucks, of 10-15 tons capacity and higher, are used effectively for transporting rock, coal, ore, and stone. Trailer dump trucks are also widely used abroad.

Structural differences in dump trucks are due to competition among manufacturers as well as to the effort to specialize according to type and purpose. Basically three types of dump trucks are produced: (1) with the body tilting backwards on both sides, and on all three sides the last type is not manufactured to any extent (2) the lift-tilt type, for unloading freight at a certain height loading free-flowing freight directly onto the railroad bunker platforms, coal into boilerhouse manholes, etc., and (3) the bunker type, mainly for large-capacity trucks, 15 tons and above, mounted on semitrailers.

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Dump-truck platforms differ both in purpose and design. Light aluminum and steel bodies are used for liquid and free-flowing freight; reinforced steel platforms are used for transporting stone.

The use of aluminum bodies, especially for light dump trucks, is worthy of attention inasmuch as they allow the useful capacity to be increased. Wooden platforms with metal fittings being unreliable and complicated to repair are not used now.

The volume of a dump-truck platform is determined from the specific gravity of the freight and averages about one cubic meter for each 1.5 tons of truck capacity. Platforms often have attachments for increasing the height of the side boards with the object of increasing the volume of the body when carrying light freight.

Lifters are, as a rule, hydraulic. Hand mechanisms are occasionally used only for small-capacity and trailer dump trucks.

Our domestic industry produced two types of dump trucks before the war in small quantities: (1) YaB-3 dump trucks of 4 tons capacity, based on the YaG-6 truck with a hydraulic lifter; most of the trucks used on large sites were of this type; and (2) GAZ-S-1 based on the GAZ-AA truck with a hand-operated lifter; these operated, for the most part, on building lots, transporting small batches of building materials.

A small number of dump trucks on the ZIS-5 chassis, capacity 2-2.5 tons, was manufactured by improvised methods in the shops of various automobile units and small enterprises.

Because of the necessity for a sharp increase in the production of motor transport, the new Stalin Five-Year Plan decreed that the Soviet auto industry must rapidly develop large-scale dump-truck production, to be based on the trucks of domestic manufacture designated for mass production in the new Five-Year Plan.

The following types of dump trucks are needed by the USSR: the 3-3.5-ton group, based on the ZIS-150 and ZIS-253 trucks, and the 5-ton group, based on the YaAZ-200 should be the most common types in building and road work. The 1.5-2-ton dump trucks, based on the GAZ-51 truck, must be produced for agricultural and small-consignment freight, and also for servicing concrete work on building operations.

It would be advantageous to manufacture powerful 14-ton dump trucks, on the chassis of the three-axle YaAZ-210 trucks, for heavy and bulky earth excavations, especially of rocky material. Multiton trailer dump trucks must be brought into service as they are extremely useful for transporting rock, coal, ore, and stone along surfaced roads.

It is possible, using the saddle-type prime mover produced by the Yaroslavl auto plant, to design semitrailer dump trucks with a capacity of 25 tons and above. Our new dump trucks must satisfy the special requirements of their work and insure reliability and durability of service.

Standard, mass-produced dump trucks should tip backwards only, with an angle of inclination of at least 50 degrees. Side-tilting bodies for dump trucks working with trailers and also those of the lift-tilt type should be produced in limited numbers to fill special orders. Reliability and durability of the lifting gear and platform should not be inferior to those of the chassis.

It can be inferred from an analysis of modern dump trucks and from experience with their operation in the USSR that the most reliable and progressive measure is to fit hydraulic lifters to all dump trucks. Their main advantages are the elasticity of the transmission system and comparative simplicity of construction and maintenance. Control of lifting speed is accomplished by turning

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a handle in the driver's cab. Lowering the platform is just as simple. In hydraulic lifters there are no gears to get dirty; this is extremely important as dump trucks often carry abrasive materials, sand, rubble, and cement.

In recent years lifters with horizontal cylinders connected to the platform by levers have become the most common. This structural solution has the following advantages: (a) almost complete independence of chassis construction; (b) smaller cost (replacement of one cylinder by a system of levers); and (c) increased dump-truck clearance.

There are also some disadvantages as compared with systems which actuate the platform directly (the mechanism adopted on the YaS-3 dump truck), i.e., complication of the kinematic links and the possibility of wear and failure of the lever system. This type of hydraulic lifter was fitted on the dump trucks which we received during the war and its performance can easily be checked.

The pump and control valve should be made in one block with the cylinder without using pipes and flexible tubes. This increases the reliability of the lifting mechanism at the expense, it is true, of some complications of the pump and control valve drives.

Telescopic lifters with three, four, or more links are used for heavy dump trucks of especially high capacity. In this case separate location of pump and valve which simplifies the drive is possible. This is also important in the installation of a lifting cylinder on a semitrailer or trailer, where connection will be made only by means of rubber tubing.

With regards to the hydraulic pump drive the most simple and reliable is a mechanical one from the gear box through a power selector. There are also very compact hydraulic lifters for light dump trucks. These have a minimum of moving parts (there is one blade and a shaft in the lifter) and no piping.

The small-capacity, gravity-type dump trucks formerly employed, where the actual weight of body and load is applied for inclining the body, are not widely used. Their essential defects are the necessity for supporting the body at a high point and uniform distribution of load.

Dump trucks intended for work in quarries and under poor road conditions must satisfy a number of additional requirements. Their chassis base must be shortened as much as possible to strengthen the frame and increase maneuverability.

It is also important to solve the problem of two-speed rear axles for medium dump trucks and additional gear boxes for heavy ones. The use of such appliances improves road holding properties and also economy. For work on especially bad roads, the production of dump trucks with four-wheel drive should be examined.

It is advantageous to organize the production of light and medium dump trucks, mounted on normal chassis, at special or auto-assembly plants. Dump trucks converted from ordinary trucks, with especially shortened chassis, are best produced at the main auto plants.

Unification and standardization of many basic elements and fastenings of dumping equipment is desirable to assure mass production of dump trucks, cheaper manufacture, and improved servicing and repair.

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